ABSTRACT

An improved charge pump circuit is provided using a triple-well structure where the charge pump circuit has a plurality of stages containing N-channel MOSFET devices in which each stage is contained in a P-well within a Deep N-well residing on a P-substrate. Each pumping stage is formed in its own P-well and the pumping stages are serially connected from power supply source to the output terminal. Each pumping stage includes a charge transfer device, a first auxiliary device to precharge the gate of the charge transfer device with a voltage from the previous stage, and a second auxiliary device to switch coupling between the charge transfer device and its substrate region to reduce the body effect and increases the capacitive boosting effect. The multiple stages of circuitry are clocked from either a four-phase clock or a two-phase clock.